

THE INFLUENCE OF PICTURES, CONTEXT AND DIFFICULTY
ON BEGINNING READING

By

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Eighty-three children (39 females, 44 males) who had completed first grade participated as subjects in this study to determine the effects of picture, context and difficulty on reading. Superior and below average readers were grouped into picture, no picture and control conditions (level and picture were between subjects factors). The experimental groups received easy and difficult word lists and stories (trials and difficulty were within subjects factors) while the control group received only the word lists. All groups received aid on a missed word during the second presentation of the stories (or word lists in the case of the control group). Total error frequencies, comprehension scores, and story category types

of error frequencies served as dependent variables. Four factor, repeated measures analyses of variance revealed significant three-way interactions for all variables and subsequent analyses were necessary to assess main effects of one variable while two others were held constant.

The effect of pictures was such that below average readers who received stories accompanied by pictures made more errors than any other group. Superior readers did not appear to be affected by the presence of pictures. Pictures also did not significantly alter comprehension scores or particular story error types for any group. Results on the effect of context were similar: below average readers made more errors on stories (in which contextual cues exist) than on word lists (in which only graphic cues exist) while superior readers made equivalent numbers of errors on both stories and word lists. Difficulty of material was significant for all dependent measures. All groups made significant improvements in word recognition on difficult material over trials. Difficult material produced poorer performance by both superior and below average readers on comprehension and story error types, and in some cases, produced different error patterns for both groups. Experimenter aid also bettered performance of poorer readers. Effects of these

variables on superior reading of easy material may have been obscured by basal effects in which superior readers made so few errors initially, that there was not much room for improvement over trials.

Results of this study clearly support the hypothesis that pictures and context interfere with poorer readers' word-decoding performance and suggest that these readers rely on inappropriate strategies such as searching for meaning and contextual cues to learn to read. Superior readers appear to use both graphic and contextual information efficiently when reading easy material but tend to rely more on graphic cues on difficult material. Suggestions for more appropriate reading material for each group are made, based on these findings. These results are also discussed in light of developmental, attentional and psycholinguistic theories of reading ability.

Chairman

INTRODUCTION

The abundant use of bright colorful illustrations in children's reading texts certainly leads one to believe that pictures accompanying printed reading material are facilitative in the acquisition of reading skill. Yet there exist very little experimental research data to support this notion. Generally, pictures have simply been assumed to foster reading skill, mostly through their attractive stimulus properties. This is a conclusion, which as Bourisseau (1965) put it, ". . . has persisted in the absence of solid research evidence and has achieved a prominent and seldom-disputed position (p.250)". Indeed, in her interview of twenty-five proponents of different beginning reading approaches, Chall (1967) noted that none of them seriously questioned the need for pictures. Miller (1938) reported that teachers believe children learn to read better with pictures for several reasons: (1) pictures introduce characters in a story; (2) they arouse and sustain interest; (3) they clarify unfamiliar concepts appearing in print; and (4) pictures furnish clues to word recognition. However, Miller (1938) found that when duplicate copies of first grade texts with no illustrations were given to half

of his subjects ($n=600$ first through third graders), the nonpicture group made 12 out of 18 possible statistically significant reading gains during the year while the picture group made only ten out of 18. While not arguing to remove pictures from all textbooks, Miller (1938) stated the absence of pictures did not cause children to read with less comprehension or interest. He concluded, ". . . it is probable that many illustrations leave much to be desired in furnishing clues to the reading material which they accompany. Anyone who has watched beginning readers at work has seen them shift their eyes from a printed word to the picture, trying to get a clue to the word from the picture. Such shifting of attention is considered by some persons to be an interference with reading (p. 676)".

Yet, because of the direct sensory appeal of pictures, it has been assumed that they facilitate learning through sensory and cognitive stimulation. Because of the popularity of pictures and belief in their instructional utility, very little systematic research has been carried out to determine the influence they have on children's reading. A recent review article by Concannon (1975) cites fewer than ten studies on the effects of pictures on reading, yet virtually every study indicated that pictures do not contribute significantly to the word-decoding ability of the child.

In the studies involving the influence of pictures on word recognition, a common paradigm has been one in which children are presented with a small number of words in no-picture and picture conditions, with training and test trials.

Samuels (1967) utilized this paradigm, with 30 pre-first graders in a preliminary word recognition task, and showed that both a simple and complex picture provided more clues for recognition and produced more correct responses than the no-picture condition. However, in the test trials when no pictures were present, the subjects trained in the no-picture condition excelled. This study alternated the acquisition and test trials purposefully so that the subjects in the picture-plus-word conditions would be aware that the words were important stimuli. Still, these subjects tended to rely on pictures when they were present instead of graphic detail of the words as cues. In a second experiment in the same study, 52 students with seven months of first grade experience were divided into picture and no-picture conditions in which a story made up of 50 separate words was used in reading instruction. The pre- and posttest consisted of presenting the subjects with the individual words for recognition. For the better readers, Samuels found no significant difference in reading acquisition between the picture and no-picture groups. However, the poorer readers learned to read significantly more words in the no-picture condition than in the picture condition. Samuels interpreted this finding as support for the notion that the poorer students were more distracted by the picture stimulus which interfered with learning to read the words. Samuels cites B.J. Underwood's principle of least effort (1963) in summarizing his research findings: the principle of least effort suggests that when both word and picture are presented together, the picture

most readily produces the desired response because at first the picture can elicit a response more quickly than the printed stimulus. So, given the two stimuli, producing a response to the picture requires less effort; however, instead of focusing on the word, the subject then attends to the picture, failing to give the necessary attention to the word.

Two other studies utilizing versions of Samuels' paradigm reveal similar findings. Duell (1968) found in teaching sight vocabulary, pictures were less effective as cues than prompter training without visual pictorial stimuli. A more recent study by Singer, Samuels and Spiroff (1974) utilized four training treatments with 164 first and second graders to determine the effect of pictures and contextual conditions on learning printed words. The four training treatments were: word-no picture; word-picture; sentence-no picture; and sentence-picture. In the test trials, only words were shown to the subjects. On both number of trials to criterion and number of correct responses, subjects in the word-no picture treatment scored significantly better than any other treatment group. In the report of their study, Singer et al. state their findings are in support of a focal attention hypothesis of Samuels (1967). Central to this hypothesis is the notion that focusing on printed words is crucial for reading acquisition and that pictures (and other contextual cues) distract children from focusing attention on the necessary orthographic detail of the words themselves.

It is indeed difficult to find experimental evidence to support the other side of the picture vs. no picture controversy.

While many authors have faithfully expounded on and cited anecdotal evidence in favor of pictures in reading texts (e.g., Whipple, 1953; and Schonell, 1961), solid data to document this belief is difficult to find. In fact, the only study not reporting evidence against the use of pictures was conducted by Hartley (1970). Hartley could not find data to support a generalization about the relative effectiveness of any one of three conditions: words alone; words with a picture; or words presented with oral context.

One quite recent report (Wardle, 1977) which suggests that illustrations in textbooks may improve reading comprehension test performance of below median reading level students also must be interpreted with caution. In that study, Wardle looked at reading comprehension for science textbook material presented in one of five ways to 191 above and below median reading level seventh-graders. Her five test conditions were: (1) text plus an illustration that answered a high number of test questions; (2) text plus an illustration answering a medium number of test questions; (3) text plus an illustration that answered a low number of questions; (4) an unillustrated text; and (5) a test without text or illustration. The results of her experiment yielded no improved reading comprehension with an illustrated or unillustrated text for the total pupil group or the above median pupil group. The below median group did answer significantly more test questions with an illustrated text, but there were no differences in improvement as a function of the amount of relevant information in the illustration. Thus, the improvement seen for below median readers could not be

attributed to the abstraction of test information from the illustration. The author suggested that perhaps the illustrations served only to interest the student in spending more time studying the text.

Two earlier studies by Vernon (1953;1954) also with older subjects (12 and 17 year olds), indicated pictures were found to occasionally help a subject remember a particular fact about a story. In general, though, an illustrated story was remembered no better than an unillustrated one. In the 1953 study, Vernon also noted that the younger or less intelligent child paid more attention to pictures than the older, more sophisticated readers.

In his dissertation, Weintraub (1960) was also interested in the effect of pictures on comprehension of the main ideas and events in a story. He compared several groups of second graders on a multiple choice test of comprehension. These groups were: boys and girls separately, children with high intelligence but low reading achievement levels, good readers and poor readers. For all groups, comprehension was greatest when text only (without pictures) was seen. Boys and girls did not differ significantly. Good readers appeared to do well regardless of the picture or no picture condition, but poor readers scored better with the text only than with either text and pictures or pictures alone.

From these studies on the effect of pictures on reading comprehension, no definitive statement can be made. While several authors feel that pictures may be motivating variables

(Whipple, 1953; Schonell, 1961), nothing can yet be said for the instructional value of pictures for reading comprehension. The fact that publishers of certain basal readers wholeheartedly endorse the use of pictures for reading comprehension development was illustrated by Chall (1967) in her analysis of two series of basal readers. Chall found, on the average, that preprimers introduce more new pictures per story than new words. In one series, she found more comprehension questions about the pictures than about the text! Even in third grade readers, 30 per cent of the questions could be answered without reading the words at all.

The studies by Vernon (1953; 1954), Wardle (1977) and Weintraub (1960) allow some comparison between good and poor readers and make differential statements about the results for the two groups. Besides the age differences which may account for the discrepancies between Wardle's and Weintraub's results, in no study was the difficulty level of reading material comparable for both groups. No attempt was made, for example, to give the poorer readers material containing easier vocabulary than the material for the superior readers. This was true for the previously cited studies on word recognition, as well, and may be an important variable for determining poor readers' utilization of pictures as clues for comprehension, e.g., if the level of material is exceedingly more difficult for poor readers than for good readers, the poor readers may be more likely to use the principle of least effort (Underwood, 1963) in searching

the illustration for clues to the story than the good readers. Clearly, when comparing good and poor readers, one important variable may be the difficulty level of reading material for both groups.

The entire picture controversy has also been seen as part of a larger controversy, namely, the role any kind of contextual information plays in the facilitation of word identification. A major proponent of the contextual or linguistic hypothesis, Goodman (1965) found that 100 readers in first, second and third grades recognized words in a story with better accuracy than when the same words appeared on lists. Goodman argued that on the word list, the child had only the cues within the words to use for recognition, while in the story, the presence of additional contextual cues in the flow of language allowed the child more information with which to recognize the words. Children in his study were given a word list to determine their level of reading and presented a corresponding story containing the words to read, thereby equating difficulty level for the subjects. However, Goodman did not provide a control group which received only words and thus the improvement he reported for word recognition in stories possibly may have been due to a practice effect or exposure to the words in the previous word test condition. He also did not report whatever differences in performance may have existed for the groups of readers he tested.

Singer, Samuels and Spiroff (1974) found results contrary to Goodman's (1965) in their comparison of word alone, word plus picture, word plus sentence and word plus sentence plus picture conditions. As reported above, subjects in their study scored best when presented with the words alone. Thus, the addition of the syntactic and semantic contextual cues in sentences did not produce superior results. However, Singer et al. (1974) did not use different words for children of different reading levels or address the relative differences between above and below average readers in these conditions. Hence their results might have obscured the differences which may exist between above and below average readers in their use of contextual information.

An alternative view may be seen in the work of Biemiller (1970) on children's development of the use of graphic and contextual information. Biemiller studied two first grade classes' reading acquisition throughout a school year and found an overall developmental progression from reliance on contextual cues through analysis of graphic detail of words to an effective combination of both strategies. Biemiller defined these three phases on the basis of the frequency of a particular type of reading error which he termed a non-response error. A non-response error was defined as the occasion on which the child stopped reading just before a word it was assumed she/he did not know. Biemiller termed the first phase a "pre-Nonresponding" phase in which readers seemed to rely primarily on contextual cues for reading.

The second stage was called the "Nonresponding" phase because of the high frequency of non-response errors found. Biemiller hypothesized that readers in this phase began to grapple with the graphic features of words. The third phase Biemiller described was the "post-Nonresponding" stage, in which readers appeared to use both context and graphic information efficiently.

He reported poorer readers tended to remain in the first phase longer than better readers. However, the poor readers who did reach the second phase did not make significantly more graphic substitutions. This led Biemiller to admit that perhaps the pattern of error types in the different phases might only reflect overall ability differences. While Biemiller's view suggested some kind of developmental factor may operate in children's use of contextual information, it also appeared from his study that poor readers and superior readers may simply differ in the extent to which they typically utilize graphic and contextual information, regardless of their place on his developmental continuum. At any rate, Biemiller stood in opposition to the encouragement of the early use of contextual and picture cues and argues this: ". . . the child's first task in learning to read is mastery of the use of graphic information, and possibly, of the notion that one specific spoken word corresponds to one written word. The child's early use of contextual information does not appear to greatly facilitate progress in acquiring reading skill (1970, p.95)".

It does appear, then, that the presence of pictures and contextual information may not facilitate acquisition of early reading skill, especially in poorer readers. If poor readers tend to ignore the orthographic detail of words, are they distracted by the presence of pictures and contextual information or is the task so difficult for them that they become frustrated and turn to extragraphical information for cues? Might not a child of even average or superior ability also turn to extragraphical cues when faced with equally difficult reading material? The possibility exists that all beginning readers may respond to difficult stories similarly, i.e., by relying more on extragraphical information.

That distractibility is a factor involved in reading disabilities is supported by a review of several studies by Tarver and Hallahan (1974) which indicated that dyslexic children may be unable to filter out extraneous and irrelevant information or focus selectively on a learning task. Results from a study by Elkind, Larson and Van Doorninck (1965) supported this idea. These investigators employed an embedded figures task in their study of slow and average readers and found that slow readers perceived fewer hidden figures than normal readers. They hypothesized that skilled reading is related to the Piagetian (1958) concept of decentration in which freedom from distractibility within an embedded context, or the ability to decenter from dominating field effects, is required.

Sabatino and Ysseldyke (1972) also found differences between readers and nonreaders on Bender Visual-Motor Gestalt tests in which stimulus designs were embedded in extraneous backgrounds, but found no differences on the standard Bender test or a Bender memory test.

These studies offer at least some support for the notion that skilled reading requires the ability to seek out relevant and ignore irrelevant information. The fact that Sabatino and Ysseldyke (1972) found nonreaders performing most poorly on the clearly more difficult task of an embedded figures design led Tarver and Hallahan (1974) to speculate that when the discrepancy between relevant and irrelevant stimuli is of sufficient magnitude, children with reading and other learning disabilities may be no more highly distracted than normal controls.

Being a bit more specific about the differences between below and above average readers, might not the difficulty level of the reading material be analogous to Tarver and Hallahan's (1974) hypothesis about relevancy of the stimuli? If poor readers are presented with reading material that is less difficult for them, i.e., in terms of vocabulary word knowledge, would they be no more distracted than better readers with the level of material that is typically used in these studies? Conversely, would superior readers be equally as "distracted," i.e., make as many errors, in a condition in which they received material that was very difficult for them? Virtually no study cited here has addressed this

problem. Only in one study (Goodman, 1965) were the difficulty levels of reading material adjusted for readers' word knowledge and in the report of that study no comparative data were presented for performance differences between groups on the different levels of material, e.g., poorer vs. better readers' performance. In short, a very important part of the puzzle is missing if below and above average readers' performance differences cannot be separated from the difficulty level factor.

The present study was designed to address three major questions concerning beginning reading. These were: (1) To what extent do pictures influence and/or interfere with the performance of superior and below average readers? (2) To what extent does the presence of contextual cues influence beginning readers' (both superior and below average) word recognition ability? (3) To what extent does difficulty level of reading material influence oral reading performance of below and above average reading? An additional objective of the present study was to assess the effect of the presentation of the word lists and stories in terms of learning over trials, with aid given on missed words in one condition so that all subjects would have had exposure to all words. To measure these effects on oral reading performance, the following dependent variables were of interest: (1) total number of errors; (2) story comprehension; (3) ten types of errors on stories, including a frequency count of self-corrections; and (4) a measure of graphic similarity of errors to story text. These measures were felt adequate to meet the objectives of the present study.

PILOT STUDY

Because a major objective of the present study was to attempt to adjust difficulty of reading material for both superior and below average readers, a pilot study was designed and carried through to provide a list of easy, intermediate and difficult words from which the testing stories and word lists would be composed.

A total of 84 children from three first grade classes participated in the pilot study. Participation in the pilot study excluded participation in the formal study itself. These children comprised entire classes and so included all levels of reading proficiency.

One hundred, sixteen words were chosen from pre-primer to fifth grade level texts and printed in lower case letters on 4 x 6 cards, one word per card. Children were tested individually in a quiet place on their sight vocabulary of these 116 words. The children were allowed ten seconds to respond to each card. All children were shown all words. A frequency count was then made of the number of correct responses to the words, and each child's score on the Reading subtest of the Metropolitan Achievement Test was compared with performance on the pilot vocabulary list.

Preparation of Test Materials

Based on the frequency counts and reading subtest scores, three separate lists of words were derived, of easy,

intermediate and difficult levels. Words included in the easy list were recognized by 88 to 100 percent of the pilot subjects. Words of intermediate difficulty were recognized by 66.6 to 79.7 percent of the children in the pilot study and the difficult words were recognized by 9.5 to 48.8 percent of the pilot subjects. The easy material was therefore easy even for poor readers, the intermediate material was difficult for poor readers and easy for better readers, and the difficult material was difficult even for better readers. From these three word lists, three stories were composed. Since the stories had to be composed from the tested words, content of the stories was not highly predictable from a semantic or plot development standpoint. Appendix contains copies of each of the stories used. There were 27 different words on the easy list and story (there were repetitions of some words, especially words such as the, a, and, etc., in all stories); 25 different words on the intermediate list and story; and 32 different words on the difficult list and story. Pictures were drawn to match each story. The pictures included details relevant to the stories as well as some aspects not directly referred to in the stories, e.g., the number of boys or girls was obvious from the picture but was not referred to in the story itself. Pictures were drawn in black ink. Amounts of information available from picture content was not assessed; however, since each picture was drawn to match each story, similar amounts of information were contained in each. Thus, the amount of story-relevant picture content was not considered as a variable in the present study.

METHOD

Subjects. Eighty-three children who had completed first grade in the Alachua County School system of Gainesville, Florida, participated as subjects in this study. The 39 females and 44 males came from the following schools, in order of greatest number from each: Glen Springs, Stephen Foster, J.J. Finley, Williams, and Metcalfe elementary schools. All subjects were tested during the summer of 1976, from June through the middle of August.

Children were selected for the study based on their total reading scores from the Metropolitan Achievement Test given in their respective schools in the spring of the year. For the purpose of this study, children who scored above the 80th percentile were considered superior readers and those who scored below the 50th percentile were considered below average readers. This higher cut-off point for the poorer readers was necessary since children who scored at the 20th and 30th percentiles were mostly nonreaders, i.e., could not read at all. Additionally, children with an Otis-Lennon Intelligence Quotient (IQ) below 85 were excluded from the sample. Superior and Below Average subjects were then randomly grouped into one of three conditions: A Picture condition, a No Picture condition, or a Word List control group.

Letters describing the study were sent home from school with the children selected (See Appendix B for a sample letter), and parents were contacted by a subsequent phone call. The parents were informed in greater detail of the study's goals (though the subject of pictures was not mentioned prior to the testing, in order to control for any bias the child might have before testing) and invited to have their child participate in the study. Parents were asked to bring the child into the laboratory in the Psychology Department for testing; if this was impossible, testing was done at the child's home.

A total of 117 children were tested. Of these, the data from 31 had to be discarded because of a subject's either limited or perfect score on the word list vocabulary. A perfect score meant that the subject recognized 100 percent of the words on the list and could not be included because no words could be classified as "difficult" for that subject. Likewise, a limited score on the word list meant that the subject recognized so few words (less than 63 percent of the "easy words") that no material would be "easy" enough for that subject, i.e., all words would be "difficult" for that subject. In the case of three other subjects, experimenter or equipment error required data from these subjects to be discarded.

Experimenters. Four experimenters were trained to administer and score the reading test. Three were females: two Caucasian (one of whom was the author) and one Black; one was a Caucasian male. The procedure for administration

and scoring was based on the procedure outlined in Goodman and Burke's (1972, Chap. 4) Manual for the Reading Miscue Inventory. Training lasted for one week until all experimenters had discussed and reached agreement on their independent scoring of six practice tapes. Experimenter instructions are included in Appendix C .

Apparatus. A quiet place with no distracting stimuli was required for testing. A cassette tape recorder was used to record the entire session with each subject.

Word lists, stories and pictures were laminated for use with the children. Copies of the word lists and stories were used by the Es to score reading errors. Samples of the word lists, stories and pictures appear in Appendix D. A small selection of inexpensive toys and candy bars was maintained, from which a child could choose one item at the close of the session, with parental permission. This reward was not mentioned at any time prior to or during the testing session.

The subject was seated in a chair in front of a table or desk on which the testing materials were placed. The experimenter explained the procedure to the subject in one of three ways, depending upon the condition. For the Picture condition, subjects were asked to read a list of words and two stories with a picture that went with each of the stories always in the same order. For the No Picture condition, subjects were asked to read a list of words and

two stories, also in the same order. For the Word List control group, subjects were asked to read a word list three times.

In both the Picture (P) and No Picture (N) conditions, subjects were presented with the word list (which comprised an easy and more difficult list of words, each word in order of difficulty), the easier story (with or without an accompanying picture) and the more difficult story, all without help. Then the subject was asked to again read the stories in the same order; however, on this second reading, the subject was told that aid would be given on a word which was missed (omitted or mispronounced), and help was given in this trial only. In the Word List (WL) control condition, help was offered on a missed word during the second presentation only. Finally, all subjects were presented with the same word list without help, on the last trial.

The Comprehension portion of the testing comprised three questions to the subjects after each reading of a story. The subjects was asked: (1) to tell the experimenter everything she or he remembered about the story (recall); (2) who was in the story; and (3) what happened in the story. The experimenter was permitted to ask the additional questions: "Who else was in the story?" and "What else happened in the story?" once each if the subject gave less than a complete answer to the initial questions.

The three word lists which were compiled on the basis of the pilot research were each of a different difficulty level. The word list presented to the subject as mentioned above was actually made up of two of the three word lists designed to be easy and difficult for the subject from the pilot study. Below Average (BA) readers received the easiest and intermediate lists and Superior (S) readers received the intermediate and most difficult lists. In addition, the BA readers received the stories (made from the word lists) of easiest and intermediate difficulty, while the S readers received the intermediate and most difficult stories, again designed to be easy and difficult for them. Since both BA and S readers received an identical word list and story, that of intermediate difficulty, this comparison matched the design of previous studies in which all subjects received the same word list or story. However, the present study also allowed for the evaluation of the relative comparisons of an easy and a difficult word list and story for both BA and S readers.

Experimenters scored the subject's errors on the word lists and stories during the session, following along on a separate copy. The tape recording of the child's oral reading was also played back afterward to complete and check the scoring.

In summary, the P and N conditions first received the word list, then the stories without aid, then the stories

with aid, and finally the original word list. On each reading of a story, the comprehension questions were asked. The WL control group was presented with the word list three times, receiving aid on a missed word during the second presentation only. The duration of the entire session was never longer than one-half hour. Sources of data were the protocols scored by the experimenters and the tape recordings of each subject's oral reading.

Dependent Variables

Error Frequencies. Total number of errors on word lists and stories, before and after aid, were totaled in order to make comparisons between the groups with regard to the effect of pictures, context of the word, effect of training (aid and practice) and level of difficulty. In the trials with aid, an error was counted and scored before correction. Comparisons between word list errors and story errors were made possible by subtracting the number of repeated errors on stories from the total number of errors on stories.

Story Error Categories. Because it is believed that oral reading provides a convenient and objective method for studying central processes occurring during reading (Fairbanks, 1937) and that oral reading errors may reflect the cognitive strategies used by readers to make sense of the reading material (Biemiller, 1970; Weber, 1968), the present study employed several categories of oral reading

errors in hopes of providing important clues about the differences between poor and superior readers. The study was designed to investigate these categories of oral reading errors as a function of the independent variables: reading level, pictures, difficulty and training.

In an article which reviews previous error classification systems and provides reliability data for a particular classification system, Hood (1976) advocates the use of a standardized and reliable system. The error classification scheme used in the present study was modeled closely after Hood's and also owes much to the system in the Reading Miscue Inventory (Burke and Goodman, 1972).

Errors were counted when the subject's response (or lack of response) did not match the printed text material in its spoken form. Dialect differences were ignored. Changes in word order, repetition errors and insertions were counted as one error (each time they occurred) even though they might have involved more than one word.

The types of errors identified were: (1) repetition: a repetition of a word or phrase (not mispronunciation of the word or phrase)---these repetitions were often anticipatory responses to a following difficult word or phrase or changes in the intonation of the word or phrase; (2) order: changes in the order of the words, e.g., sun

up was/sun was up¹; (3) reversal: substitution of a word containing the same letters as the text word but in a different sequence, e.g., form/from; (4) stem: substitution of a word containing the same stem as the text word, e.g., looking/looked; (5) affix: substitution of a word containing the same affix as the text word, e.g., picked/looked, dissatisfied/disappeared; (6) substitution: substitution of a meaningful word for a text word if it may not be previously categorized as a reversal, stem or affix error; (7) nonsense: substitution of part of a word or a nonsense word if it may not be previously categorized as a reversal, stem, or affix error. It should be noted that that reversal, stem, affix, substitution and nonsense errors are all kinds of a more general substitution for text words. In addition, (8) insertion: an insertion of one or more words between two text words; and (9) omission: a word omitted, either inadvertently, or as an indication that it was not known. In addition, it was considered desirable to know whether a child spontaneously self-corrected his/herself, whether the error was a repeated one, e.g., the child produced an error on the same word later in the story, and whether or not the error produced was graphically similar to the text.

Graphic similarity was considered important as a measure

¹The error is italicized and precedes diagonal line; text follows.

of the child's use of graphic cues. Graphic similarity was determined from a modification of Cohen's (1975) criteria. An error was considered graphically similar to the text if: (1) the error word and the text word shared a common first, last or both first and last letter-sound, e.g., lighted/looked; or (2) the error word and the text word have at least half of the letter sounds in common, e.g., eel/leaf, terrific/traffic. Common last letters were included as a criterion after a literature review found that both Weber (1970) and Marchbank and Levin (1965) contend that beginning readers exploit the letters in the end positions of words as "salient cues yielding high information (Weber, 1970, p. 156)".

Comprehension. For the experimental groups, a story comprehension measure was obtained from the subject's responses to the comprehension questions mentioned above. Scoring was based on assigned points for character recall and development, events and general plot or theme of the stories. Since the stories were relatively short and simple, these answers were typically brief. Detailed guidelines for scoring comprehension were composed (See Appendix E) and a total of 25 points were possible for each story.

Reliability

In studies where data points are subject to variability due to differences among experimenters, a check on data reliability is necessary before statistical analysis proper can be undertaken. In Hood's (1976) study, she not only isolated the most useful error categories; in addition, she obtained measures of inter-judge reliability on scoring of total error, meaning loss errors, repetitions, proportions of graphically similar errors and errors self corrected, and scores for contextual appropriateness. Her judges were five female college graduates who were trained for one week. Cronbach's alpha reliability coefficient (1951) was used and reliabilities which would hold under various numbers of judges were estimated. For most errors, Hood found that no appreciable increase in reliability occurred when more than two judges were used. Support for this finding also comes from Y. Goodman (1971) who recommends two judges be employed for recording and counting errors. In the present study then, two judges per task were employed.

In the present study, four female college undergraduates as well as the author were judges for reliability scores on word list errors, story error categories, total errors on stories and comprehension. Training of the judges required approximately five hours. A random sample of data from 30 subjects (with equal numbers from each of

the six treatment groups) was scored for reliability. Percentage of agreement between two judges was used as the measure of reliability. Percentage agreement was defined as the number of agreements divided by the sum of the number of agreements plus the number of disagreements, multiplied by 100. The percentage agreement for total errors on word lists was 99.28; for total errors on stories, 98.65; for story error categories, 87.79; and for total comprehension scores, 86.45. In the case of a disagreement, the rater and the author discussed the differences. In most cases, the data as scored by one of the original experimenters were used for the analyses.

Data Analysis

The data required a four factor repeated measures analysis of variance; the two Between subjects factors were pictures and reading level and the two Within subjects factors were difficulty level and trials (the four repeated measurements). A Statistical Analysis System (SAS: Barr, Goodnight, Sall and Helwig, 1976) general linear models procedure was utilized to accommodate the data. The general linear models (glm) procedure was chosen because it provides tests of hypotheses for the effects of a linear model regardless of the number of missing cells or the degree of confounding in the model. SAS also allows the user to specify one or more of four types of sums of squares and their estimable functions. Type II SS were suggested for use in the present analysis because they

provide the reduction in SS due to a particular effect, given all other effects, i.e., only the parameters associated with the effect are involved.

Initial analyses were performed to determine any main effects due to Experimenter or Sex and subsequent analyses for main effects due to each of the four factors and their interactions were performed for each of the dependent variables.

RESULTS

Experimenter, Sex and Race Effects

Four separate analyses were employed to test for an experimenter effect, each using the *glm* procedure. The first was a model in which the effect of experimenter, picture and level (of the subject's reading ability) were tested for main effects and interactions on a sum of errors across all trials. There was no significant main effect for experimenter ($F = 1.79, p < .15$) or for any two-way or three-way interactions with picture and level (See Table 1). Three subsequent analyses were run using the same model, on the following combinations of total errors on the repeated measures (trials): the word lists before the stories, the stories, and the word lists following the stories. None of these analyses was significant either (See Table 1) despite the fact that these extra analyses might increase the chance of finding a significant effect, and so the variable experimenter was dropped from the model.

To test for significant effects due to sex, a model which included sex, picture and level was employed. There was no significant main effect of sex ($F_{1,71} = 1.69, p < .19$) nor any significant two-way interactions involving the

Table 1

<u>Experimenter</u>				
<u>Source</u>	<u>df</u>	<u>SS</u>	<u>F</u>	<u>p</u>
<u>For Summed Errors</u>				
Experimenter	3	3578.618	1.79	n.s.
Experimenter x Pictures	6	1499.097	0.37	n.s.
Experimenter x Level	3	2612.884	1.31	n.s.
Experimenter x Pictures x Level	7	5288.464	1.13	n.s.
Error	60	39999.181		
<u>For Word List Before</u>				
Experimenter	3	310.348	2.20	n.s.
Experimenter x Pictures	6	215.108	0.76	n.s.
Experimenter x Level	3	95.572	0.68	n.s.
Experimenter x Pictures x Level	7	282.907	0.86	n.s.
Error	60	2820.128		

Table 1 (cont.)

Source	df	SS	F	p
<u>For Stories</u>				
Experimenter	3	842.973	1.51	n.s.
Experimenter x Pictures	6	468.419	0.42	n.s.
Experimenter x Level	3	1221.357	2.19	n.s.
Experimenter x Pictures x Level	7	2522.404	1.94	n.s.
Error	60			
<u>For Word List After</u>				
Experimenter	3	283.658	1.84	n.s.
Experimenter x Pictures	6	57.925	0.19	n.s.
Experimenter x Level	3	78.971	0.51	n.s.
Experimenter x Pictures x Level	7	196.415	0.55	n.s.
Error	60	3079.331		

independent variables picture and level (See Table 2). There was, however, a significant three-way interaction involving sex, picture and level ($F = 2.89.$ $p < .03$). Upon examination of the six picture-level treatment combinations, it was determined that this effect may have been the result of the particular below average-no picture (BAN) grouping,¹ in which there were ten males and three females. The fact that there was no significant sex x level interaction was most likely due to the occurrence in the BAWL group of an oppositely-loaded imbalance of nine females and five males. At any rate, this three-way interactions was not considered important enough to leave the variable sex in the model and so it was also dropped.

The effect due to race of the subject was not included in the analysis. There were a total of 13 Black children included in the study, one of whom was in a superior reading group. Since no group contained an equal number of Black and white children, it was felt that the contribution of race to the differences between groups would be a random effect. Consequently, due to the few numbers of Black children, the variable race was not included in the subsequent models for data analysis.

¹Hereafter each of the six treatment groups will be indicated by combinations of their letter abbreviations for picture and level conditions, e.g., BAN=BA for below average level plus N for the no picture condition.

Table 2

Sex

Source	df	SS	F	p
Sex	1	345.657	1.69	n.s.
Sex x Pictures	2	284.040	0.70	n.s.
Sex x Level	1	84.347	0.41	n.s.
Sex x Pictures x Level	4	2359.781	2.89	< 0.0282
Error	71	14497.874		

The Regression Model

Once the variables experimenter and sex were removed from the model, a complete four-factor model was written which included pictures, level, trials, (repeated measures) and difficulty. The dependent variable was a corrected total error score, i.e., for the stories, repeated errors were subtracted from total errors to allow for fair comparisons across trials. The design for this model was based on a multifactor repeated measures plan found in Winer (1962, p. 350). The model used the SAS glm procedure. A summary of this analysis of variance appears in Table 3. There were main effects for all four factors (Pictures: $F_{2,77} = 8.85$, $p < .0001$; Level: $F_{1,77} = 35.94$, $p < .0001$; Trials: $F_{3,539} = 100.24$, $p < .0001$; Difficulty: $F_{1,539} = 824.20$, $p < .0001$) and all two-way interactions were also significant. There was also two three-way interactions (pictures x level x trials and pictures x level x difficulty) which were significant. Because these significant three-way interactions involved both Between and Within subjects factors and because each of the Between and Within factors was crossed with the other, it was necessary to perform a post-hoc analysis on all possible pairs of the smallest cells (each four-way combination). For this purpose, a Duncan's multiple comparison procedure

Table 3
Four Factor ANOVA

Source	df	SS	F	p
Pictures	2	1534.143	8.85	<0.0003
Level	1	3115.614	35.94	<0.0001
Pictures x Level	2	601.755	3.47	<0.036
Error: Subject (Pictures x Level)	77	6674.499	12.32	<0.0001
Trials	3	2115.157	100.24	<0.0001
Pictures x Trials	6	236.760	5.61	<0.0001
Level x Trials	3	233.175	11.05	<0.0001
Pictures x Level x Trials	6	111.624	2.64	<0.0155
Difficulty	1	5797.355	824.20	<0.0001
Pictures x Difficulty	2	186.615	13.27	<0.0001
Level x Difficulty	1	85.061	12.09	<0.0005
Pictures x Level x Difficulty	2	64.110	4.56	<0.0109
Trials x Difficulty	3	129.608	6.14	<0.0005
Pictures x Trials x Difficulty	6	12.683	0.30	n.s.
Level x Trials x Difficulty	3	19.132	0.91	n.s.
Pictures x Level x Trials x Difficulty	6	20.422	0.48	n.s.
Error	539	3791.297		

was utilized. Although Duncan's multiple comparison test was not specifically designed for multiply classified data, it is acceptable to use it for this purpose and the User's Guide to SAS (Barr, Goodnight, Sall and Helwig, 1976) specifies a procedure which allows for this function. This procedure compared the 48 cells (four of which were redundant for the control group since control subjects received only three trials compared to four trials for the experimental groups) for significant differences. Many of these comparisons were meaningless and will not be reported here.

The Effect of Pictures on Total Errors
(Word Recognition)

The BAP treatment group differed from all other groups on the most difficult story ($\bar{x}=21.93$ errors). Similarly, the BAP group differed significantly from the BAN group on the easy story ($\bar{x}=12.00$ vs. $\bar{x}=9.076$, respectively). In the other story condition (stories with aid), again the effect of pictures on the two BA groups was such that the group which received pictures made significantly more errors on the difficult story ($\bar{x}=16.64$) than the group which received no pictures ($\bar{x}=14.384$). However, for the easy story with aid, the two BA groups did not differ significantly ($\bar{x}_{BAP}=9.285$, $\bar{x}_{BAN}=7.153$).

For the superior groups, pictures did not produce any significant differences on the difficult story or the easy story. Nor did pictures significantly influence differences between the two superior groups on the subsequent stories with aid.

The Effect of Context on Word Recognition

The control groups (SWL and BAWL) were included in these comparisons to rule out possible explanations of differences based on practice effects over trials. On the story conditions, it must be remembered that a fair comparison dependent measure was obtained by subtracting repeated errors from total errors.

The BA readers were clearly influenced by the presence of context effects in stories. For the difficult word list and story, the BAP group made significantly more errors on stories ($\bar{x}_{WL}=15.642$ vs. $\bar{x}_{STRY}=21.928$). Again, for the easy word list and story, the effect of context for this group was such that significantly fewer errors were made on the word list ($\bar{x}=6.928$ vs. $\bar{x}=12.000$). For the BAN group, results were parallel: more errors were made on stories than word lists, regardless of difficulty of material ($\bar{x}=4.846$ vs. $\bar{x}=9.076$ for the easy material; $\bar{x}=12.769$ vs. 16.000 for the difficult material). None of the BA groups significantly differed from each other on errors on the easy word list ($x_{BAP}=6.928$, $\bar{x}_{BAWL}=4.857$, $\bar{x}_{BAN}=4.846$). The control group (BAWL) did

not differ significantly from the first presentation of the word lists to the second, for either easy or difficult material, thus ruling out a practice effect on the first two trials.

The superior groups, on the other hand, did not differ significantly on errors made on word lists vs. stories regardless of difficulty of the material. The SP and SN groups also did not differ from each other significantly on these conditions, nor did the SP group differ from the SWL group significantly. The means for these groups appear in Table 4.

The Effect of Trials on Word Recognition (Learning)

Comparisons were made between word lists given before and after stories (or repeated presentations of the word list in the case of the control groups) to assess for learning.

For difficult material, every group made significant gains over trials (See Table 4). Performance improvements ranged from 4.643 to 2.571 words. The BAWL group made the largest decrease in errors, an absolute difference of 4.643, over trials.

However, this significant improvement in every group's performance was not always the case for easy material (See Table 4). There were no significant differences in

Table 4
Error Means on Word Lists

Difficult

	WLB	WLA
SP	8.214	4.500
BAP	15.643	11.357
SN	10.357	6.000
BAN	12.769	9.154
SWL	6.286	3.714
BAWL	10.286	5.643

Easy

	WLB	WLA
SP	2.286	1.571
BAP	6.928	4.143
SN	2.786	2.000
BAN	4.845	2.692
SWL	1.643	1.071
BAWL	4.857	2.071

the performance of superior readers across trials, on easy material, which may have been due to small differences between basal and ceiling measures for these readers. In general, superior readers did not make as many errors in the first trials as below average readers, thus there may have been little room for significant improvement for the superior readers.

The Effect of Difficulty and Level on Word Recognition

Easy and difficult materials were clearly distinguished by number of errors made on each. In every condition (WL, STRY, STRY with AID, and WL) there were significant differences between easy and difficult material for every group (SP, BAP, SN, BAN, SWL and BAWL).

In some cases, BA readers and S readers performed equally well on material that had been designed to be similarly easy and difficult for both groups. For example, there were no significant differences between BAWL, SN and SP groups or the BAN, BAWL and SN groups on the easy word list. However, in most cases S readers made fewer errors than BA readers on easy and difficult material, e.g., on the difficult story, S readers made significantly fewer errors than BA readers in the same conditions ($\bar{x}_{SP} = 9.571$, $\bar{x}_{BAP} = 21.928$; $\bar{x}_{SN} = 11.642$, $\bar{x}_{BAN} = 16.000$; $\bar{x}_{SWL} = 6.857$, $\bar{x}_{BAWL} = 9.857$).

A multiple comparison test does not allow an effect to be analyzed holding all other effects constant, so that effects of difficulty and level on word recognition have been reported elsewhere under the effects of pictures and trials, since they are factors crossed with these other factors. In addition, difficulty and context effects are inseparable as reported above, though one may still isolate one or the other factor.

Models for other Dependent Measures

For all other dependent measures, the data was reorganized to look at only those groups and trials on which these measures were recorded. An overall analysis using a total model which included the independent variables picture, level, aid (formerly trials, the new variables included only two levels --- stories with aid and stories without aid) and difficulty. A glm analysis of variance was performed with this model on all dependent variables. The story error category labeled "order" had only two readings differing from zero and so was dropped from the analyses. Also, the dependent variable affix took a zero value in two of the subsequent analyses and consequently an additional analysis excluding the variable affix was performed for these two cases. A MANOVA was performed in the glm procedure using the full model to test for main effects and interactions for all other dependent variables including comprehension and story error categories.

The Effect of Pictures on Other Measures

There was no significant main effect for pictures for any of the other dependent variables which included comprehension and story error types. A MANOVA test using the Motelling-Lawley Trace also did not reject the hypothesis of no overall pictures effect ($F_{12,40}=0.74$, $p < .71$). Similarly, there were no significant two-way, three-way or four-way interactions involving the pictures variable.

The Effect of Aid, Level and Difficulty

on Story Error Categories

The MANOVA tests for main effects due to aid, level, and difficulty yielded significant ratios. Since there were also significant interactions among these factors, the effects of each were studied by observing one variable at fixed levels of the other two. The results of this procedure are presented in the subsequent sections for the remaining dependent variables.

A general note in regard to the effects of the independent variable aid is in order here. Since aid on stories was always given in the same order, i.e., no aid, then aid, there was no way to rule out an effect of order when scores were higher due to aid. Thus, the

effects of aid and practice are confounded for all variables. This factor may alternatively or more appropriately be seen as the effect of trials or practice, as it was in the previous analysis for effects on total errors.

Comprehension

The dependent variable comprehension was considered an important variable in this experiment, particularly with regard to the effect of pictures on comprehension. As presented above in Table A1, the effect of pictures on comprehension was nonsignificant.

The effect of difficulty on comprehension scores was significant for both S and BA subjects on the first stories (without aid). Superior readers had a mean comprehension score of 3.928 on the difficult story vs. a mean score of 5.000 on the easy story. Likewise, the BA readers had a mean score of 1.222 on the difficult story and a mean score of 3.555 on the easy story.

The effect of aid on comprehension was significant for S and BA reader for difficult stories only. Superior subjects had higher mean comprehension scores when aid was given than when it was not ($\bar{x}=5.500$ vs. $\bar{x}=3.928$). Similarly, BA subjects scored higher on the comprehension measure when aid was given than when it was not ($\bar{x}=4.296$ vs. $\bar{x}=3.555$).

The effect of level on comprehension was significant in two cases: on the easy story with aid, superior subjects had a mean score of 5.678 while below average subjects had a mean score of 4.296; on the difficult story without aid, superior subjects had a mean score of 3.928 while BA subjects had a mean score of 1.222. These significant results may not be easily interpreted in the former case because of the effect of aid/practice, but it is interesting to note that comprehension scores of BA and S readers did not differ for easy stories before aid, or for difficult stories with aid. The results of these independent variables' effects on comprehension are summarized in Table of the Appendix.

Repetitions, Reversals, and Insertions

The results of the analyses of the effects on repetitions, reversals and insertion errors are grouped together because the analyses revealed no significant differences between groups for any combination of the independent variables. The summary table for these results appear in Table A2 of the Appendix.

Stem Errors

There was only one condition in which significant differences occurred in stem errors. This was for the variable aid on BA reading of difficult stories. These subjects made more stem errors ($\bar{x}=0.852$) on stories before

aid than on stories with aid ($\bar{x}=0.370$). Again, this effect must be interpreted with caution since a practice effect cannot be ruled out. The summary of results appears in Table A3 of the Appendix.

Affix Errors

In two instances, errors of the affix type could not be included in the overall model because the variable affix took on only the value of zero which produced singular error matrices. These were the analyses labeled aid for BA subjects on easy material and level on easy stories with aid. Additional analyses removing the variable affix from the model were performed for the other variables in these instances and are included in the appropriate sections.

The effect of difficulty on affix errors was significant only for the S readers, at both levels of aid. The means for easy and difficult stories without aid, respectively, were 0.071 and 1.607. Likewise, the means for easy and difficult stories, respectively, with aid were 0.000 and 1.107.

The effect of aid was nonsignificant at every combination of level and difficulty, except the one that could not be computed due to zero values in both aid and no aid conditions.

The effect of level was significant for difficult stories with and without aid. There were no significant effects for easy stories. On difficult stories without aid, S readers made significantly more affix errors than BA readers ($\bar{x}=1.607$ vs. $\bar{x}=0.111$). On difficult stories with aid, S readers again made significantly more affix errors ($\bar{x}=1.107$) than BA readers ($\bar{x}=0.074$). Results of these analyses are summarized in Table A4 of the Appendix.

Substitutions

The effect of difficulty on substitution errors was significant in every case except one. In general, both BA and S readers made more substitutions on difficult material. Superior readers made significantly different mean substitutions 1.571 and 2.857 times, respectively, on easy and difficult stories without aid; they obtained significantly different mean substitution error scores of 0.964 and 2.357, respectively, on easy and difficult stories with aid. BA readers also obtained significantly different mean substitution error scores of 3.852 and 5.815, respectively, on easy and difficult stories with aid. Below average readers did not make significantly different mean numbers of substitutions on easy or difficult stories without aid.

The effect of aid or practice did not produce any significant differences on substitution errors for three

out of four combinations of level and difficulty. However, for BA readers on easy material, aid was associated with fewer substitution errors ($\bar{x}=3.852$) than no aid ($\bar{x}=6.185$).

Readers' level contributed significantly to substitutions on every combination of aid and difficulty. In every case, S readers made fewer substitutions than BA readers. The means were 1.571 and 0.964, respectively, vs. 6.185 and 3.852, respectively, for superior vs. below average readers on easy stories with and without aid. For difficult stories with and without aid, respectively, the mean scores were 2.857 and 2.357 for S readers vs. 6.296 and 5.815 for BA readers. Results of the analyses for substitutions appear in Table A5 of the Appendix.

Nonsense Errors

Difficulty of the reading material caused significant differences in nonsense errors for superior readers only, in both aid and no aid conditions. In the no aid conditions, these subjects made more nonsense errors on difficult material ($\bar{x}=2.893$) than on easy material ($\bar{x}=0.500$). In the aid trials, S readers again made significantly more errors on difficult material ($\bar{x}=1.250$) than on easy material ($\bar{x}=0.286$).

Aid was a significant variable for S readers on difficult stories ($\bar{x}_{\text{No Aid}}=2.893$ vs. $\bar{x}_{\text{Aid}}=1.250$) and for BA readers on easy stories ($\bar{x}_{\text{No Aid}}=1.888$ vs. $\bar{x}_{\text{Aid}}=1.148$), in both cases aid or practice producing fewer nonsense errors.

Level was significant for the difficult stories, with and without aid. For stories without aid, S readers made significantly more nonsense errors ($\bar{x}=2.893$) than BA readers ($\bar{x}=2.111$). For stories with aid, however, BA readers made significantly more errors ($\bar{x}=1.333$) than S readers ($\bar{x}=1.250$). Table A6 of the Appendix summarizes these results.

Omissions

For every analysis studying difficulty at four combinations of level and aid, significant differences existed. Superior readers made more omissions on difficult than easy material, regardless of aid. The means were 4.571 and 0.714 errors, respectively, on difficult and easy stories without aid. The means on difficult and easy stories with aid were 4.250 and 0.786 errors, respectively. Likewise, BA readers made significantly more omissions on difficult than on easy material, regardless of aid. On stories without aid, BA mean error scores were 19.11 and 6.074, respectively, for difficult and easy material. Similarly, on stories with aid, the means were 12.630 errors vs. 3.630 errors, respectively, for difficult vs. easy material.

The effect of aid or practice was significant in two instances for BA readers only. These subjects made fewer omissions with aid on both easy and difficult stories. For the easy stories, the mean errors were 3.630 with aid and 6.074 without aid. For the difficult stories, mean errors were 12.630 with aid and 19.111 without aid.

Level of subjects' reading ability was also an important factor in omission errors, BA readers making more omissions than S readers in every case ($\bar{x}_{BA}=6.074$ vs. $\bar{x}_S=0.714$ for easy stories without aid; $\bar{x}_{BA}=19.111$ vs. $\bar{x}_S=4.571$ for difficult stories without aid; $\bar{x}_{BA}=3.630$ vs. $\bar{x}_S=0.786$ for easy stories with aid; and $\bar{x}_{BA}=12.630$ vs. $\bar{x}_S=4.250$ for difficult stories with aid). Summary of these results appears in Table A7 of the Appendix.

Self-Corrections

Difficulty did not affect mean numbers of self-corrections to a significant extent, for any combination of level and aid.

Aid or practice produced significant differences in three instances: for both S and BA readers on easy material and for S readers on difficult material. Mean number of self-corrections were lower with aid or practice than without it in these conditions. For S readers, the mean scores were 1.428 and 1.857, respectively, for easy and difficult stories without aid, and 0.571 and 0.893, respectively, for easy and difficult stories with aid.

Below average mean scores for easy stories were 2.852 without aid and 1.555 with aid.

Level was a significant factor in self-corrections in two cases, both on easy stories. On easy stories without aid, S readers made fewer self-corrections ($\bar{x}=1.428$) than BA readers ($\bar{x}=2.852$). On easy stories with aid, S readers also made fewer self-corrections than BA readers ($\bar{x}=0.571$ vs. $\bar{x}=1.555$). Again, since S readers made so few errors, they could hardly self-correct very much. Results are summarized in Table A8 of the Appendix.

Repeated Errors

In every case, repeated errors were more frequent on difficult than easy material ($\bar{x}=3.107$ vs. $\bar{x}=0.500$ for S readers on stories without aid; $\bar{x}=0.893$ vs. $\bar{x}=0.286$ for S subjects on stories with aid; $\bar{x}=11.888$ vs. $\bar{x}=5.592$ for BA subjects on stories without aid; and $\bar{x}=6.074$ vs. $\bar{x}=1.481$ for BA subjects on stories with aid).

Also, in every case, S readers made fewer repeated errors than BA readers (see mean scores above).

The effect of aid or practice was significant in three out of four combinations. Aid did not produce significant differences in S readers' repeated errors on easy stories without aid. In all other cases, though,

aid or practice produced fewer repeated errors than no aid (see mean scores above). Results of these analyses are summarized in Table A9 of the Appendix.

DISCUSSION

Pictures

The results from the analyses of the effect of pictures on word recognition and types of errors provide substantial support for the previous findings of Singer, Samuels and Spiroff (1974) and Samuels (1967). Superior readers did not differ on number of errors in picture and no picture conditions, while below average readers in the picture condition made significantly greater numbers of errors than those in the no picture condition. Thus it appears that pictures do indeed influence beginning reading of below average ability. However, when aid for a missed word was given on the easy stories, pictures did not significantly influence differences between the two below average groups. Thus, if a below average reader has had practice with words and the words are of an easier level, pictures may not interfere.

Pictures did not significantly influence comprehension or types of errors made. The result for comprehension is in line with earlier results of Vernon's (1954) and supports Chall's (1967, p. 259) contention that while

full-color illustrations are the most expensive features of reading texts, it has not been demonstrated that they help children either to recognize words or comprehend text. Given the finding that pictures interfere with word recognition on stories for below average readers, one might expect that as a result of that process, comprehension of story material should also be impaired. While pictures did not significantly contribute to comprehension scores, they also did not impair them in the present study. It may be that better comprehension measures than the crude one in the present study or the one in Vernon's study (number of facts remembered about a story) need to be developed to adequately assess the effect of pictures on this measure of reading. A very detailed and complex measure has very recently been developed by Drum (1977) which may prove helpful in this regard. Another explanation may be that even while pictures interfered with word recognition for poorer readers, these readers may have used the pictures or contextual cues in the stories to bring them up to the level of the other readers on comprehension. Still another alternative may be that superior readers were able to recognize or sound out correctly more words, but were not reading for meaning or understanding, since the below average and superior groups did not differ from each other in two cases of comprehension scores.

An additional original question was whether pictures might not produce certain types of errors more frequently, e.g., more types of errors which were nonsensical or not graphically similar to the text, since the child might be distracted by the pictures. The fact that pictures in this study did not account for a significant amount of variance between groups or particular types of errors did not support this hypothesis. In the present study, the number and distinction between types of errors may have been too many or may have obscured the effect, but the graphic similarity measure has at least partially ruled out that explanation. A more precise measure of graphic similarity, using a mathematical formula (Weber, 1970) may be a future task to undertake in this regard. Yet the interpretation may simply be that while pictures interfere with poorer readers' word recognition, these children may use a combination of cues to produce their wrong answers. This interpretation might concur with Biemiller's (1970) notion of developmental phases in the use of contextual and graphic information in learning to read. Perhaps the poorer readers in the present study would be in his "pre-nonresponding" phase in which there is more reliance upon contextual cues. However, one might expect to see better performance on stories than word lists if this is the case. In the present study,

this result was not obtained for below average readers. Still, the poorer readers may indeed have been relying more on contextual cues which did not bring them success on the stories.

These results imply readers of below average ability may require early reading material without pictures and with aid on focusing attention to graphic detail when vocabulary is especially difficult for them. The fact that the poorer readers performed better with aid is not surprising since the experimenter's help on a given word would most likely direct the reader's attention to the word and thus force the reader to focus on the graphic detail or configuration of the word. For easy material, the below average readers may have mastered the words enough to be able to use orthographical cues efficiently without the frustration of difficult material which might have forced them to turn to extragraphical information. Pictures may serve this function for the below average reader on difficult material, i.e., they may offer the child an alternative method for decoding words which is not successful since a picture cannot reliably direct the child to an abstract symbolization or picture-word association. There are two methods of beginning reading instruction containing no pictures which do exist, based on the author's beliefs that the child learning to read

should not rely on them. One method, the Bloomfield system (1963) argues that the first task of learning to read is breaking the code, or the alphabetic principle. Oral reading is stressed over silent reading at first, and use of context cues is also discouraged. The second method, the Carden Reading Method (Carden, 1967) also excludes pictures and emphasizes comprehension and literary appreciation as well as phonic skills.

Though this study did not address the issue, pictures may also inhibit a child's development of creative imagery and storytelling techniques. In Chall's interview (1967) of 25 reading specialists, one author said, ". . . in first grade, pictures are a big part of our word-analysis program, . . . but there is no question that there may be a delimiting effect of pictures on concepts and creativity. . . (p. 70)". In addition, Chall suggests that having children rely on pictures to learn to read may rob them of early intellectual growth. She states, "Pointing to and naming or writing a letter at an early age is quite different from pointing to or drawing a picture of a cat, truck or tree. The child who can identify. . . a letter engages in symbolic representation. When the child engages in symbolic representation, he is already practicing a higher form of intellectual behavior (1967, p. 159)". The author cites no research to support these beliefs but it may well be another important issue to study.

The possibility of a developmental trend over age groups would be a further avenue to pursue in regard to the picture question. Wardles' (1977) data may suggest that older readers of below average ability may be helped by the presence of pictures, on certain types of material. Because of what appears to be the publishing companies' insistence on more and more full-color illustrations in texts, do the reading series themselves set up a learning paradigm in which children are shaped to look at the pictures for clues because the answers to the comprehension questions can more easily be found in the pictures? Or, as a child grows older, do pictures really begin to take on relevant meaning for text material, especially in some content areas such as science?

The question of what is considered relevant for picture content also arises. The present study did not attempt to modulate relevancy, color or location of pictures. The pictures used were relatively modest in comparison to those in most readers; they were black and white, story-related and were placed at the left side of the story. Still they distracted below average readers from the stories. The fact that the pictures used in the present study did not contribute significantly to comprehension scores or other types of errors may

reflect this simplicity of design. However, there is at least one reading program, the Gibson-Richards program, or Language through Pictures Series (1963) which uses only black and white stick figures and argues for their success in serving as useful clues to sentences. Richards (1968) suggests the use of pictures of "hieroglyphic simplicity --- not as cues merely to word meanings but as an accompanying pictorial language, pruned of distractive possibilities (p. 362)". The position of pictures as well as their stimulus content may be another potential area of study. For example, if the pictures are seen after the story, as in the Distar method (Engelmann and Bruner, 1974) and not with the story, might they be less likely to interfere with attention to graphic detail, and more likely to reinforce the learning of new words? This appears to be an exciting avenue to pursue.

In summary, the results of the present study indicate that pictures may interfere with beginning reading when readers are of below average level. When the same words have been used repeatedly, individual aid is given, and the words are of an easy difficulty level, pictures may no longer distract the poor reader. Pictures do not appear to help or hinder superior beginning reading.

Also, the pictures used in this study did not contribute significantly to comprehension scores or to particular types of errors.

Context

The results of this study also support and extend the focal attention hypothesis (Samuels, 1967) with regard to the issue of contextual cues in reading. Again, the poorer readers made more errors on stories than on word lists, while those who received only word lists did not differ across the two trials, thus ruling out a practice effect. While Samuels reported the effect of pictures on poor reading, neither he nor his colleagues, Singer et al. (1974) reported the deleterious contextual effect specifically for poor readers. They did note overall reduced performance with context, but did not report differences due to level of the readers. This finding is in opposition to that of Goodman's (1965) in which word recognition in stories was higher than that on word lists, regardless of a subject's reading ability.

The fact that superior readers did not differ on word recognition from word list to story may be interpreted as support for a hypothesis such as that of Biemiller's (1970) in which readers progress to a stage in which they

utilize both graphic detail of individual words and contextual information present in stories. The pattern of errors revealed for superior readers on difficult material would suggest that even superior readers, though, may "regress" to an earlier developmental stage when faced with difficult material. This error pattern is discussed further in a later section.

Again, the results of the present study would indicate that poorer readers do not learn words as efficiently when they are presented in stories as when they are presented in isolation on a word list.

Difficulty

The present study showed difficulty of reading material to be an important factor to consider in studies of beginning reading. Further refinement of the process whereby easy and difficult material is devised for below and above average readers is needed. To make fair generalizations about the effect of any other variable, difficulty levels for superior and below average readers need to be equated at the beginning of testing. This is not always easy to do for the beginning reader of below average ability whose sight vocabulary may not be very large to start with. The present procedure was only partially successful because below average readers made more errors than superior readers even on easy material, but represents an improvement over past studies which did not consider it as a variable. The study did allow superior and below average readers to perform at comparable levels in many cases (e.g., on comprehension of easy stories. Also, certain other effects (e.g., the effects of level and practice) were significant only for difficult or easy material, and this is an important extension over previous studies. An example of this was the significant effect of level found only for the difficult stories on nonsense errors:

superior readers made more nonsense errors than below average readers on difficult stories without aid, another example was that found for differences in before and after word recognition --- for superior readers, the effect was significant only for difficult material which may have been due to the basal effect for superior readers on easy material.

Learning

Learning, or improvement in word recognition across trials occurred for all groups on difficult material and for below average readers on easy material as well. Even though practice effects were likely across so many trials, the effects of aid from the experimenter were most likely also contributory, because in the case of superior and control subjects, no improvement occurred in the two trials before aid was given though significant improvement did occur in both groups after aid. This result would seem obvious since giving the subject the word would allow learning, but some practice effect of trial and error may also have occurred across trials.

Learning appeared to be most enhanced for below average readers, by a simple reading of a word list with individual aid given on the unknown or missed words, and a post-test of the same list to reinforce the learning.

No significant word knowledge was gained by superior readers on easy material, but this was probably due to the fact that the superior readers usually had fewer new words to learn in the first place, and so their improvement might be small in comparison to that of below average readers. Yet, one might also expect the opposite finding --- with fewer new words to learn, superior readers might be expected to be able to master them more easily than if they had many new words to learn. The possibility exists that these readers were not challenged by the easy material, which brings up the question of how best to improve learning in superior readers. Since pictures did not help or hinder their reading and stories vs. word lists did not help or hinder, the present data suggest material of sufficient difficulty may be helpful in increasing these readers' sight vocabulary.

Types of Story Category Errors

Repetition, reversal, insertion and omission errors. The present study found no differences between groups on repetition reversal or insertion errors. The result for reversals was somewhat surprising in view of the fact that poor readers (especially dyslexic children) are typically seen as evidencing more of these kinds of

errors (Meier, 1972). However, none of the first graders in the present study had been identified as specifically learning disabled nor did any attend a resource room as part of their school program. Many of the poor readers had been recommended for a summer remedial reading program, but were ineligible to participate because their scores were above the 20th and 30th percentiles on the Metropolitan Reading test. So, the population of poor readers studied here may be distinct from more severely disabled readers in terms of their error patterns.

There were also no differences between groups on numbers of repetitions or insertions. Thus, both superior and below average readers may repeat words for other reasons than difficulty of the word. Likewise, below average readers in general did not appear to insert irrelevant or extraneous words into stories more often than superior readers, as might have been guessed. However, below average readers did omit significantly more words than superior readers and this may have been their pattern of approach to a difficult or unknown word. Below average readers also made more self-corrections than superior readers on easy stories, but both groups made equal numbers on difficult material. This result may again be due to the basal effects for superior readers on easy material.

Types of substitution errors. Stem, affix, substitution and nonsense errors may all be seen as particular types of substitutions of words other than the text words. As might be expected on an error type which contains part of the correct word, superior readers made more affix errors than below average readers. This was also the case for nonsense errors on difficult stories without aid. Nonsense errors and graphic similarity were highly correlated at .72, so that this finding may not be as surprising as one might at first think. Nonsense errors are simply incomplete or meaningless words and may still represent an attempt to decode the material. However, this finding was reversed on stories with aid, in which below average readers made more nonsense errors. It may be that, as attention was drawn to the words with individual aid, initial attempts at recognition, or a vacillation between word and picture, yielded these types of errors. Also, the effect of aid may have been to motivate the poor readers to try to decode or sound out the words which would also produce more nonsense errors. The general results may also suggest though, that the superior readers were at first reading difficult material word by word, not relying on the contextual cues of the sentences, but with aid and

practice began to do so, or that with aid, they began to use both contextual and graphic cues, as Biemiller (1970) suggests. The fact that poorer readers made more substitutions of complete and meaningful words than better readers also implies that the poorer readers may rely heavily on meaning and contextual cues in reading, but that these strategies are largely unsuccessful for them in learning to recognize new words.

CONCLUSION

The results of the present investigation point out several important findings. Firstly, pictures and contextual cues do not appear to contribute significantly to beginning reading and especially appear to interfere with poorer readers' acquisition of new word vocabulary. Secondly, difficulty of the material used can be an important variable in studies comparing below and above average reading. Thirdly, several interpretations were made about the relative differences between these two groups on particular types of errors. The characterization of the superior reader as an efficient user of both context and graphic detail may be questionable in certain cases of difficult material, and characterization of poorer readers as strugglers for meaning in reading may be justified on the basis of these results. When material is very difficult, superior readers may tend to decode words graphically rather than using both contextual and graphic information. Poorer readers tend to rely on inappropriate strategies, utilizing meaning and contextual cues on difficult material but aid may assist them in more attempts to decode words.

Many future studies suggested here may hold interesting answers to the questions raised by this study. For example, an extension of the present study over second and third grades, with a follow-up at grade seven would provide much needed data on the developmental trends which may be present in the use of pictorial and contextual cues in easy and challenging reading.

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APPENDIX

Table A1
Comprehension

Source	df	SS	F	p
<u>Difficulty</u>				
Level=1, Aid=1	1	16.071	4.32	<0.0439
Error	13	315.429		
Level=1, Aid=2	1	0.446	0.08	n.s.
Error	13	166.304		
Level=2, Aid=1	1	73.500	23.69	<0.0001
Error	13	88.333		
Level=2, Aid=2	1	3.130	0.41	n.s.
Error	13	148.333		
<u>Aid</u>				
Level=1, Difficulty=1	1	6.446	1.32	n.s.
Error	13	13.304		
Level=1, Difficulty=2	1	34.571	6.67	<0.0135
Error	13	258.429		
Level=2, Difficulty=1	1	7.407	2.62	n.s.
Error	13	60.204		
Level=2, Difficulty=2	1	90.741	12.76	<0.0010
Error	13	209.481		

Table A1 (cont.)

Source	df	SS	F	p
<u>Level</u>				
Difficulty=1, Aid=1	1	28.679	3.39	n.s.
Error	26	219.666		
Difficulty=1, Aid=2	1	26.263	5.13	<0.322
Error	26	133.237		
Difficulty=2, Aid=1	1	100.676	10.58	<0.0032
Error	26	247.524		
Difficulty=2, Aid=2	1	39.035	3.26	n.s.
Error	26	311.074		

Table A2
Repetitions, Reversals and Insertions

Source	df	SS	F	p
<u>Repetitions</u>				
<u>Difficulty</u>				
Level=1, Aid=1	1	1.143	1.74	n.s.
Error	13	13.357		
Level=1, Aid=2	1	0.000	0.00	n.s.
Error	13	7.714		
Level=2, Aid=1	1	0.463	0.25	n.s.
Error	13	16.833		
Level=2, Aid=2	1	3.130	0.41	n.s.
Error	13	148.333		
<u>Aid</u>				
Level=1, Difficulty=1	1	0.446	0.59	n.s.
Error	13	13.304		
Level=1, Difficulty=2	1	0.161	0.27	n.s.
Error	13	11.732		
Level=2, Difficulty=1	1	5.352	4.92	<0.0324
Error	13	13.750		
Level=2, Difficulty=2	1	0.019	0.01	n.s.
Error	13	34.833		

Table A2 (cont.)

Source	df	SS	F	p
<u>Level</u>				
Difficulty=1, Aid=1	1	2.179	1.94	n.s.
Error	26	29.157		
Difficulty=1, Aid=2	1	0.0385	0.06	n.s.
Error	26	18.098		
Difficulty=2, Aid=1	1	3.418	2.58	n.s.
Error	26	34.427		
Difficulty=2, Aid=2	1	1.727	1.26	n.s.
Error	26	35.709		
<u>Reversals</u>				
<u>Difficulty</u>				
Level=1, Aid=1	1	0.0000	0.00	n.s.
Error	13	4.8571		
Level=1, Aid=2	1	2.9286	1.18	n.s.
Error	13	0.6429		
Level=2, Aid=1	1	0.0000	0.00	n.s.
Error	13	11.2593		
Level=2, Aid=2	1	0.4629	1.94	n.s.
Error	13	1.7500		

Table A2 (cont.)

Source	df	SS	F	p
<u>Aid</u>				
Level=1, Difficulty=1	1	0.0179	3.18	n.s.
Error	13	9.3036		
Level=1, Difficulty=2	1	0.8750	2.79	n.s.
Error	13	4.2321		
Level=2, Difficulty=1	1	0.6667	1.70	n.s.
Error	13	4.1481		
Level=2, Difficulty=2	1	0.0185	0.06	n.s.
Error	13	7.0833		
<u>Level</u>				
Difficulty=1, Aid=1	1	0.051	0.09	n.s.
Error	26	13.058		
Difficulty=1, Aid=2	1	0.841	4.01	n.s.
Error	26	5.459		
Difficulty=2, Aid=1	1	0.051	0.12	n.s.
Error	26	11.058		
Difficulty=2, Aid=2	1	0.318	1.70	n.s.
Error	26	4.864		

Table A2 (cont.)

Source	df	SS	F	p
<u>Insertions</u>				
<u>Aid</u>				
Level=1, Difficulty=1	1	1.143	2.30	n.s.
Error	13	7.857		
Level=1, Difficulty=2	1	0.000	0.00	1.000
Error	13	2.428		
Level=2, Difficulty=1	1	0.1852	0.08	n.s.
Error	13	3.1204		
Level=2, Difficulty=2	1	1.852	2.04	n.s.
Error	13	7.342		
<u>Level</u>				
Difficulty=1, Aid=1	1	0.011	0.04	n.s.
Error	26	7.416		
Difficulty=1, Aid=2	1	1.051	2.99	n.s.
Error	26	9.149		
Difficulty=2, Aid=1	1	1.601	2.54	n.s.
Error	26	16.381		
Difficulty=2, Aid=2	1	0.012	0.05	n.s.
Error	26	6.288		

Table A2 (cont.)

Source	df	SS	F	p
<u>Insertions</u>				
<u>Difficulty</u>				
Level=1, Aid=1	1	0.018	0.09	n.s.
Error	13	4.232		
Level=1, Aid=2	1	1.446	2.85	n.s.
Error	13	6.875		
Level=2, Aid=1	1	1.500	1.95	n.s.
Error	13	9.333		
Level=2, Aid=2	1	0.074	0.23	n.s.
Error	13	2.833		

Table A3
Stem Errors

Source	d ²	SS	F	p
<u>Difficulty</u>				
Level=1, Aid=1	1	0.01 ²	0.03	n.s.
Error	13	5.232		
Level=1, Aid=2	1	0.286	0.59	n.s.
Error	13	7.714		
Level=2, Aid=1	1	2.666	2.92	n.s.
Error	13	10.342		
Level=2, Aid=2	1	0.166	0.47	n.s.
Error	13	3.648		
<u>Aid</u>				
Level=1, Difficulty=1	1	0.161	0.30	n.s.
Error	13	11.303		
Level=1, Difficulty=2	1	0.000	0.00	1.000
Error	13	5.000		
Level=2, Difficulty=1	1	0.2963	0.65	n.s.
Error	13	8.0000		
Level=2, Difficulty=2	1	3.130	4.50	<0.0403
Error	13	10.583		

Table A3 (cont.)

Source	df	SS	F	p
<u>Level</u>				
Difficulty=1, Aid=1	1	0.044	0.07	n.s.
Error	26	16.983		
Difficulty=1, Aid=2	1	0.132	0.40	n.s.
Error	26	8.614		
Difficulty=2, Aid=1	1	1.702	2.78	n.s.
Error	26	15.907		
Difficulty=2, Aid=2	1	0.231	0.53	n.s.
Error	26	11.296		

Table A4
Affix Errors

Source	df	SS	F	p
<u>Difficulty</u>				
Level=1, Aid=1	1	33.018	31.31	<0.0001
Error	13	13.304		
Level=1, Aid=2	1	17.161	31.85	<0.0001
Error	13	4.589		
Level=2, Aid=1	1	0.166	3.12	n.s.
Error	13	0.583		
Level=2, Aid=2	1	0.074	2.03	n.s.
Error	13	0.426		
<u>Aid</u>				
Level=1, Difficulty=1	1	0.071	1.00	n.s.
Error	13	0.928		
Level=1, Difficulty=2	1	3.500	3.02	n.s.
Error	13	31.857		
Level=2, Difficulty=1		CANNOT BE COMPUTED		
Error				
Level=2, Difficulty=2	1	0.018	0.22	n.s.
Error	13	1.287		

Table A4 (cont.)

Source	df	ss	F	p
<u>Level</u>				
Difficulty=1, Aid=1	1	0.070	0.98	n.s.
Error	26	1.857		
Difficulty=1, Aid=2		CANNOT BE COMPUTED		
Error				
Difficulty=2, Aid=1	1	30.764	26.36	< 0.0001
Error	26	30.345		
Difficulty=2, Aid=2	1	14.669	38.03	< 0.0001
Error	26	10.030		

Table A5
Substitutions

Source	df	SS	F	p
<u>Difficulty</u>				
Level=1, Aid=1	1	23.143	4.02	<0.0515
Error	13	60.429		
Level=1, Aid=2	1	27.161	19.85	<0.0001
Error	13	51.304		
Level=2, Aid=1	1	0.166	0.01	n.s.
Error	13	157.120		
Level=2, Aid=2	1	52.018	4.35	<0.0436
Error	13	123.000		
<u>Aid</u>				
Level=1, Difficulty=1	1	5.161	1.99	n.s.
Error	13	41.232		
Level=1, Difficulty=2	1	3.500	0.81	n.s.
Error	13	78.857		
Level=2, Difficulty=1	1	73.5000	9.44	<0.0039
Error	13	167.9815		
Level=2, Difficulty=2	1	3.130	0.17	n.s.
Error	13	129.083		

Table A5 (cont.)

Source	df	SS	F	p
<u>Level</u>				
Difficulty=1, Aid=1	1	292.596	32.34	<0.0001
Error	26	198.431		
Difficulty=1, Aid=2	1	114.610	31.24	<0.0001
Error	26	95.372		
Difficulty=2, Aid=1	1	162.578	23.61	<0.0001
Error	26	179.058		
Difficulty=2, Aid=2	1	164.334	24.14	<0.0001
Error	26	177.003		

Table A6
Nonsense Errors

Source	df	SS	F	p
<u>Difficulty</u>				
Level=1, Aid=1	1	80.161	20.72	< 0.0001
Error	13	61.089		
Level=1, Aid=2	1	13.018	9.49	< 0.0037
Error	13	20.732		
Level=2, Aid=1	1	0.666	0.21	n.s.
Error	13	51.500		
Level=2, Aid=2	1	0.463	0.22	n.s.
Error	13	51.620		
<u>Aid</u>				
Level=1, Difficulty=1	1	0.643	1.23	n.s.
Error	13	9.357		
Level=1, Difficulty=2	1	37.786	9.89	< 0.0031
Error	13	109.214		
Level=2, Difficulty=1	1	7.4074	4.06	< 0.0507
Error	13	24.9815		
Level=2, Difficulty=2	1	8.166	1.85	n.s.
Error	13	42.583		

Table A6 (cont.)

Source	df	SS	F	p
<u>Level</u>				
Difficulty=1, Aid=1	1	26.515	21.43	<0.0001
Error	26	32.166		
Difficulty=1, Aid=2	1	10.224	13.55	<0.0011
Error	26	19.622		
Difficulty=2, Aid=1	1	8.400	1.59	n.s.
Error	26	137.345		
Difficulty=2, Aid=2	1	0.095	0.03	n.s.
Error	26	83.750		

Table A7

Omissions

Source	df	SS	F	p
<u>Difficulty</u>				
Level=1, Aid=1	1	208.286	13.32	<0.0007
Error	13	183.357		
Level=1, Aid=2	1	168.018	20.37	<0.0001
Error	13	141.732		
Level=2, Aid=1	1	2294.518	25.67	<0.0001
Error	13	2635.037		
Level=2, Aid=2	1	1093.500	25.29	<0.0001
Error	13	1206.342		
<u>Aid</u>				
Level=1, Difficulty=1	1	0.071	0.05	n.s.
Error	13	20.000		
Level=1, Difficulty=2	1	1.446	0.08	n.s.
Error	13	455.303		
Level=2, Difficulty=1	1	80.6667	4.48	<0.0407
Error	13	557.8148		
Level=2, Difficulty=2	1	567.130	5.69	<0.022
Error	13	3738.342		

Table A7 (cont.)

Source	df	SS	F	p
<u>Level</u>				
Difficulty=1, Aid=1	1	394.870	20.25	<0.0001
Error	26	507.066		
Difficulty=1, Aid=2	1	111.171	12.33	<0.0017
Error	26	234.511		
Difficulty=2, Aid=1	1	2905.822	22.61	<0.0001
Error	26	3341.024		
Difficulty=2, Aid=2	1	965.181	16.94	<0.0003
Error	26	1481.046		

Table A8
Self-Corrections

Source	df	SS	F	P
<u>Difficulty</u>				
Level=1, Aid=1	1	2.571	1.29	n.s.
Error	13	22.857		
Level=1, Aid=2	1	1.446	2.60	n.s.
Error	13	10.732		
Level=2, Aid=1	1	16.666	2.69	n.s.
Error	13	91.259		
Level=2, Aid=2	1	0.166	0.08	n.s.
Error	13	33.750		
<u>Aid</u>				
Level=1, Difficulty=1	1	10.286	8.08	<0.0007
Error	13	15.500		
Level=1, Difficulty=2	1	13.018	12.07	<0.00012
Error	13	25.875		
Level=2, Difficulty=1	1	22.6852	5.82	<0.0207
Error	13	84.0093		
Level=2, Difficulty=2	1	1.185	0.28	n.s.
Error	13	40.537		

Table A8 (cont.)

Source	df	SS	F	p
<u>Level</u>				
Difficulty=1, Aid=1	1	27.844	5.90	<0.0224
Error	26	122.764		
Difficulty=1, Aid=2	1	13.313	13.05	<0.0013
Error	26	26.524		
Difficulty=2, Aid=1	1	0.186	0.06	n.s.
Error	26	83.114		
Difficulty=2, Aid=2	1	4.182	2.04	n.s.
Error	26	53.345		

Table A9
Repeated Errors

Source	df	SS	F	p
<u>Difficulty</u>				
Level=1, Aid=1	1	95.161	22.54	<0.0001
Error	13	38.589		
Level=1, Aid=2	1	5.161	6.92	<0.0120
Error	13	9.804		
Level=2, Aid=1	1	535.185	19.79	<0.0001
Error	13	658.620		
Level=2, Aid=2	1	284.741	25.92	<0.0001
Error	13	142.083		
<u>Aid</u>				
Level=1, Difficulty=1	1	0.643	2.22	n.s.
Error	13	14.857		
Level=1, Difficulty=2	1	68.643	15.02	<0.0004
Error	13	38.000		
Level=2, Difficulty=1	1	228.1667	20.19	<0.0001
Error	13	152.4259		
Level=2, Difficulty=2	1	456.463	18.77	<0.0001
Error	13	741.981		

Table A9 (cont.)

Source	df	SS	F	p
<u>Level</u>				
Difficulty=1, Aid=1	1	356.481	38.86	<0.0001
Error	26	238.518		
Difficulty=1, Aid=2	1	19.654	17.96	<0.0002
Error	26	28.455		
Difficulty=2, Aid=1	1	1060.036	33.97	<0.0001
Error	26	811.345		
Difficulty=2, Aid=2	1	368.997	42.54	<0.0001
Error	26	225.530		

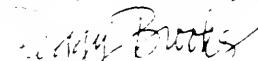
APPENDIX B

GLEN SPRINGS ELEMENTARY SCHOOL

2826 N.W. 31st Avenue
Gainesville, Florida 32605

Phone 904-378-2411

This summer, a number of Glen Springs children will be selected to participate in a simple but important experiment on how children learn to read. If your child is selected, we will be contacting you by phone during the early part of the summer. If you do not wish your child to participate, please return this form indicating your wish. Do not return the form if you are interested or if you have questions regarding the research. Any questions you have can be answered at the time you are phoned by Ms. Brooks. We think this will be an interesting and rewarding study and we hope your child may be involved.



Peggy Brooks, M.A.

Lilly May Shaw
Principal

I do not wish my child to participate in the reading experiment.

Child's Name

Your Name

APPENDIX C

Instructions to Experimenter

All subjects receive the word list first. Choose the one appropriate for the child's level. Have the child say his/her name, grade and school. Then play it back for child to hear and to check operation of tape recorder. Show child the word list and say: "Here is a list of words to read. I want you to go down the list and read the words to me out loud. If you come to a word you do not know, you may guess at it or skip it because I'm not going to be able to give you any help on it."

For subjects in the picture plus story (SP and BAP) conditions, next place the easier story in front of the child and the corresponding picture to the left of the story. Say, "Here is a story and a picture that goes with the story. I want you to read the story out loud. If you come to a word you do not know, you may guess at it or skip it because I'm not going to be able to help you on it." Repeat this procedure for the difficult story. Also, for other story conditions (SN and BAN) repeat this procedure, omitting the phrase regarding the picture. After each reading of a story, ask the child

the comprehension questions (listed elsewhere). Now repeat the presentation of both stories (with or without the pictures), saying, "Now I'd like you to read the same story again to me. This time, if you come to a word you do not know I'll be able to help you on it." Present these in the same order, easy then difficult. Again ask the comprehension questions after each one. Finally, present the original word list to the child, saying, "Finally, I want you to read the words on this list again to me out loud. If you come to one you don't know, you'll have to guess at it or skip it because I won't be able to give you any help this time."

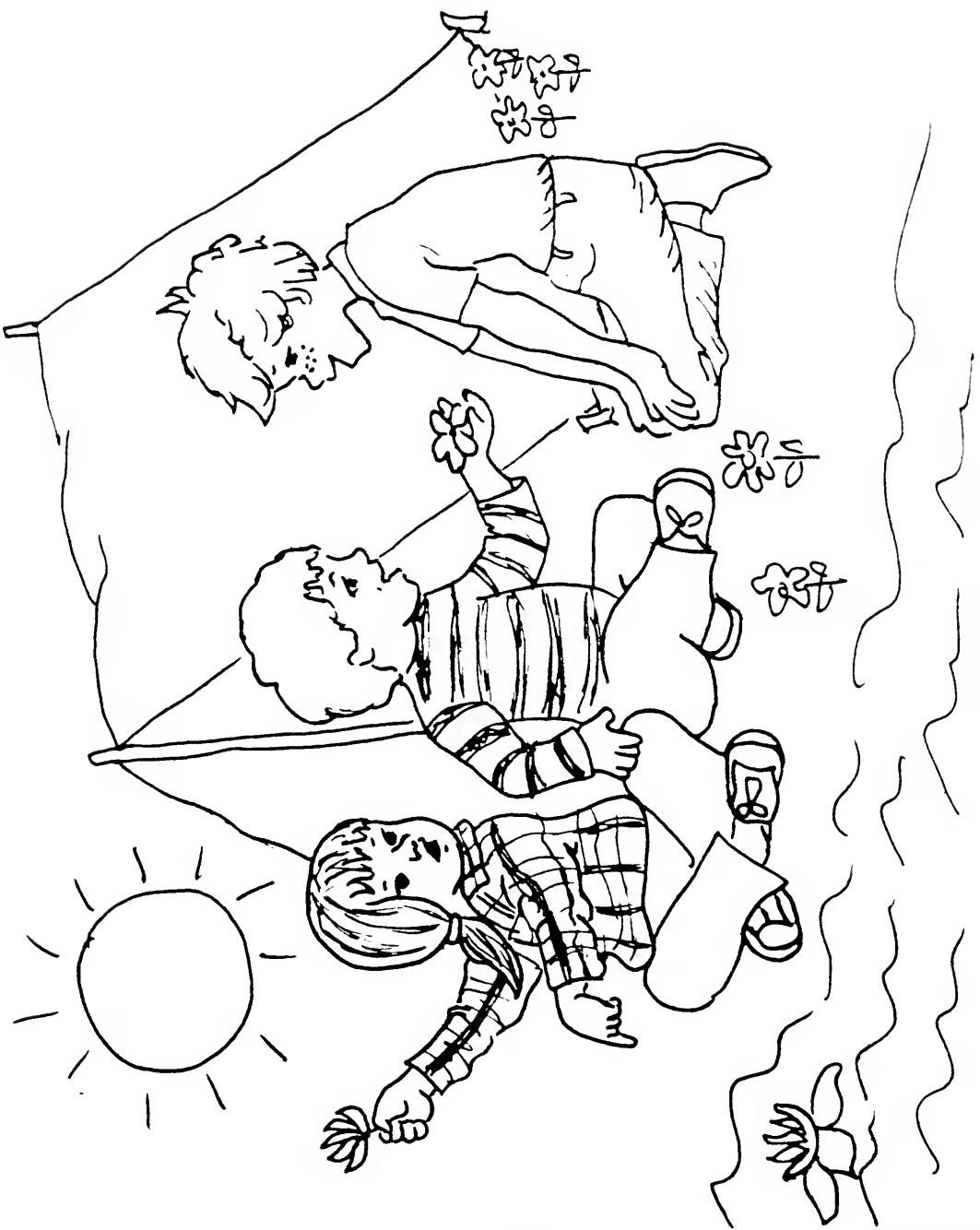
For subjects in the control condition, present the word list a second time, saying, "Now I want you to read these words out loud again. This time, I'll be able to give you help on any words that you miss." Finally, give the subject the same word list a third time, saying, "Once again, read these words out loud. If you come to one you don't know, you'll have to guess at it or skip it because I won't be able to give you any help this time."

Record all errors on separate copies of the word list and story. When finished, play back the tape to check your scoring.

APPENDIX D

IS	THESE	RESTAURANT
ARE	ON	BACK
SIT	HAD	FOOD
COLD	DELICIOUS	DISAPPEARED
TO	BY	NOW
SCHOOL	WE	
AROUND	SOME	
FINDS	TO	
TENT	PLANS	
OTHER	BEGUN	
BY	PROVIDED	
OUT	BEAUTIFUL	
THREE	OUR	
SAND	EXPECTED	
IN	PICNIC	
HANDS	TREMBLE	
WATER	BICYCLES	
SUNNY	DAY	
OF	FOR	
CHILDREN	TRAFFIC	
BRIGHT	TOOK	
IT	REJECT	
FRIEND	COMMUNITY	
AND	THUNDERSTORM	
OUTSIDE	BUCKETS	
A	OWNED	
FLOWERS	OCEAN	
THE	WHO	
ANOTHER	PEOPLE	

APPENDIX D (cont.)



APPENDIX E

GUIDELINES FOR COMPREHENSION SCORING

Characters: Recall: Listing of characters in story.

Development: Information concerning characters' physical appearance, attitudes, feelings, behavior, relationship to other characters.

Events: Happenings as they occur.

Plot: Plan upon which sequence of events is organized, overall question or problem which is central concern.

Scoring

In first story (The sun was up),

	<u>Points</u>		<u>Points</u>
<u>Characters:</u>	Dog 1	<u>Development:</u>	<u>Big Dog</u> 1
<u>Recall:</u>	Bug 1		
	Cat 1		Bug is red 1
			Total = 5

<u>Events:</u>	Sun was up.	1
	<u>It was big and red.</u>	1
	<u>Dog on hill.</u>	1
	<u>It was hot.</u>	1
	<u>Dog has leaf.</u>	1
	<u>Leaf is good fan.</u>	1

	<u>Points</u>	
<u>Bug on leaf.</u>	1	
<u>Cat looks at dog.</u>	1	
<u>Cat sees bug.</u>	1	
<u>Cat has rope.</u>	1	
<u>Rope fits dog.</u>	1	
<u>Cat can get bug.</u>	1	
		Total = 12

APPENDIX E (cont.)

Plot: Any general statement which suggests

- | | <u>Points</u> |
|---|---------------|
| (1) The dog used the leaf as a fan because it was so hot. (not a repetition of the events <u>of</u> the story). | 3 |
| (2) The cat wants the bug on the leaf and ties up the dog <u>so that</u> (he or she, the cat) can get the bug. | 5 |
| Total = | 8 |

Total possible comprehension score = 25.

APPENDIX E (cont.)

Story 2 (These children are out of. . .)

<u>Characters:</u>	Children 1	<u>Development:</u>	Children are friends. 1
<u>Recall:</u>	Friends 1		
		They are good friends. 1	
		There are 3 of them. 1	
			Total = 5

<u>Events:</u>	Children out of school. 1	
	It is bright and sunny outside. 1	
	Friends sit by a tent. 1	
	A tent is on the sand. 1	
	The tent is by the water. 1	
	Water is cold. 1	
	Around tent are flowers. 1	
	One friend finds a flower. 1	
	One friend finds a flower in the sand. 1	
	One friend hands (or gives) flower to another friend. 1	
	One friend sits by water. 1	
	One friend finds flower in water. 1	
		Total = 12

Plot: Any general statement which suggests

- | (1) | Because school is out, three children who are good friends set up by the water. (Not a repetition of the story sentences--this must be a kind of summary statement | <u>Points</u> |
|-----|--|---------------|
| | | 3 |

APPENDIX E (cont.)

- (2) The friends are either finding flowers everywhere and/or giving them to one another. 5

Total = 8

Total possible comprehension score = 25.

APPENDIX E (Cont.)

Story 3 (We had expected a beautiful. . .)

Points

Characters

Recall: We or they (a group of people)
 People in the community

2

1

Development: People who owned a restaurant
 People owned bicycles

1

1

Total = 5

Events: We (They) had expected a beautiful day.
 They were having a picnic by the ocean.
 People in community owned a restaurant.
 People in community provided delicious food.
 We (They) took bicycles in traffic to the ocean.
 The beautiful day disappeared.
 The ocean started to tremble, because of a thunderstorm (or rain).
 We had to reject our plans for a picnic.
 to bicycle back to our community (home).

1

1

1

1

1

1

1

1

1

1

1

1

1

Total = 12

Plot: Any general statement which suggests

- (1) Some poeple (we or they) expected good weather for a picnic at the beach and so made plans (or "They planned a picnic")

3

APPENDIX E (cont.)

- | | |
|--|----------|
| (2) Because the weather changed, it ruined their (picnic) plans (or "They expected a nice day but it wasn't) | 3 |
| (3) Their response to the weather change was to bicycle back home. (<u>Because</u> the weather was so bad). | <u>2</u> |
| Total = | 8 |

Total possible comprehension score = 25.

BIOGRAPHICAL SKETCH

Peggy Ruth Brooks was born in Savannah, Georgia, on October 28, 1951. She graduated from Ocala High School in Ocala, Florida, in June, 1969, as a Florida Regents Scholar with high honors. She attended Furman University in Greenville, South Carolina, from 1969 to 1971, during which time she studied for a term at Birkbeck College of the University of London with the Furman in England program. She transferred to the University of Florida in 1971 where she majored in psychology and graduated with high honors in June, 1973. In September, 1973, Ms. Brooks entered the doctoral program in Clinical Psychology at the University of Florida.

In August, 1975, Ms. Brooks received the Master of Arts degree. During the 1976-1977 academic year, she completed an Internship in Clinical Psychology at Worcester Youth Guidance Center in Worcester, Massachusetts. Ms. Brooks took a position as Director of the Learning Development Center at Mount Holyoke College, South Hadley, Massachusetts, in September, 1977.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Nathan W. Perry
Nathan W. Perry, Chairman
Professor of Clinical Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Suzanne Bennett Johnson
Suzanne B. Johnson
Assistant Professor of Clinical
Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

W. Keith Berg
W. Keith Berg
Associate Professor of Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Wiley C. Rasbury
Wiley C. Rasbury
Assistant Professor of Clinical
Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Donald G. Childers
Donald G. Childers
Professor of Electrical Engineering

This dissertation was submitted to the Graduate Faculty of the Department of Clinical Psychology in the College of Arts and Sciences and to the Graduate Council, and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

December, 1977

Dean, Graduate School

UNIVERSITY OF FLORIDA



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